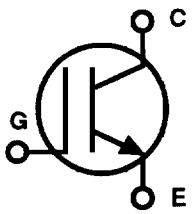

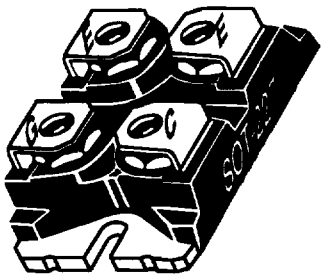

ADVANCED POWER TECHNOLOGY®

APT90GF100JN 1000V 90A

SINGLE DIE ISOTOP® PACKAGE

POWER MOS IV® IGBT

"UL Recognized" File No. E145592 (S)

N-CHANNEL ENHANCEMENT MODE HIGH VOLTAGE POWER INSULATED GATE BIPOLAR TRANSISTOR

MAXIMUM RATINGS All Ratings: T_C = 25°C unless otherwise specified.

Symbol	Parameter		APT90GF100JN	UNIT
V_{CES}	Collector-Emitter Voltage		1000	Volts
V_{GE}	Gate-Emitter Voltage	±20		
I_{C1}*	Continuous Collector Current	90		Amps
I_{C2}	Continuous Collector Current @ T_C = 90°C	50		
I_{CM}	Pulsed Collector Current ①	180		
I_{LM}	Clamped Inductive Load Current @ T_J = +125°C ②	100		
E_{ARV}	Reverse Voltage Avalanche Energy	100		mJ
P_D	Total Power Dissipation	415		Watts
T_J,T_{STG}	Operating and Storage Junction Temperature Range	-55 to 150		°C
T_L	Max. Lead Temp. for Soldering: 0.063" from Case for 10 Sec.	300		

STATIC ELECTRICAL CHARACTERISTICS

Symbol	Characteristic / Test Conditions / Part Number		MIN	TYP	MAX	UNIT
BV_{CES}	Collector-Emitter Breakdown Voltage (V_{GE} = 0V, I_C = 3.0mA)	APT90GF100JN	1000			Volts
RBV_{CES}	Collector-Emitter Reverse Breakdown Voltage (V_{GE} = 0V, I_C = 1.0A)		-15	-25		
V_{GE}(TH)	Gate Threshold Voltage (V_{CE} = V_{GE}, I_C = 6.0mA)		2.5		6	
V_{CE}(ON)	Collector-Emitter On Voltage (V_{GE} = 15V, I_C = I_{C2})			2.6	4	
I_{CES}	Collector Cut-off Current (V_{CE} = 0.8 V_{CES}, V_{GE} = 0V)				2	mA
	Collector Cut-off Current (V_{CE} = 0.8 V_{CES}, V_{GE} = 0V, T_C = 125°C)				4	mA
I_{GES}	Gate-Emitter Leakage Current (V_{GE} = ±20V, V_{CE} = 0V)				±100	nA
V_{GE}/ΔT_J	Gate-Emitter Threshold Voltage Temperature Coefficient			-7.2		mV/°C
gfe	Forward Transconductance (V_{CE} = 10V, I_C = I_{C2})			52		S

CAUTION: These Devices are Sensitive to Electrostatic Discharge. Proper Handling Procedures Should Be Followed.

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052-1021 Rev C

DYNAMIC CHARACTERISTICS

APT90GF100JN

Symbol	Characteristic	Test Conditions	MIN	TYP	MAX	UNIT
C_{ies}	Input Capacitance	**Capacitance** V_{GE} = 0V, V_{CE} = 10V, f = 1 MHz		8200	9000	pF
C_{oes}	Output Capacitance			1200	1700	
C_{res}	Reverse Transfer Capacitance			320	450	
Q_g	Total Gate Charge ③	**Gate Charge** V_{GE} = 10V, V_{CC} = 0.5 V_{CES}, I_C = I_{C1}		255	350	nC
Q_{ge}	Gate-Emitter Charge			60	85	
Q_{gc}	Gate-Collector ("Miller") Charge			145	200	
$t_d(on)$	Turn-on Delay Time	**Resistive Switching (25°C)** V_{GE} = 15V, V_{CC} = 0.5 V_{CES}, I_C = I_{C2}, R_G = 2Ω		40	80	ns
t_r	Rise Time			50	100	
$t_d(off)$	Turn-off Delay Time			90	140	
t_f	Fall Time			400	700	
$t_d(on)$	Turn-on Delay Time	**Inductive Switching (125°C)** V_{CLAMP}(Peak) = 0.8V_{CES}, V_{GE} = 15V, I_C = I_{C2}, R_G = 2Ω, T_J = +125°C		20	40	ns
t_r	Rise Time			20	40	
$t_d(off)$	Turn-off Delay Time			450	675	
t_f	Fall Time			450	700	
E_{on}	Turn-on Switching Energy			2	4	mJ
E_{off}	Turn-off Switching Energy			9	18	
E_{ts}	Total Switching Losses			11	22	
$t_d(on)$	Turn-on Delay Time	**Inductive Switching (25°C)** V_{CLAMP}(Peak) = 0.8V_{CES}, V_{GE} = 15V, I_C = I_{C2}, R_G = 2Ω, T_J = +25°C		20	40	ns
t_r	Rise Time			20	40	
$t_d(off)$	Turn-off Delay Time			150	300	
t_f	Fall Time			250	500	
E_{ts}	Total Switching Losses			6	12	mJ

THERMAL / PACKAGE CHARACTERISTICS

Symbol	Characteristic	MIN	TYP	MAX	UNIT
$R_{\theta JC}$	Junction to Case			0.3	°C/W
$R_{\theta JA}$	Junction to Ambient			20	
L_C	Internal Collector Inductance (Measured From Collector Terminal to Center of Die)		3		nH
L_E	Internal Emitter Inductance (Measured From Emitter Terminals to Emitter Bond Pads)		5		
$V_{Isolation}$	RMS Voltage (50-60 Hz Sinusoidal Waveform From Terminals to Mounting Base for 1 Min.)	2500			Volts
$C_{Isolation}$	Collector-to-Mounting Base Capacitance (f=1MHz)		35		pF
Torque	Maximum Torque (Mounting = 8-32 or 4mm Machine and Terminals = 4mm Machine)			13.6	lb•in

① Repetitive Rating: Pulse width limited by maximum junction temperature.

② V_{CLAMP} = 0.8V_{CES} Volts, R_G = 2Ω.

③ See MIL-STD-750 Method 3471

* This product when used in very fast switching circuits (turn-off $^{dv}/_{dt}$ > 15 volts per ns) and under operating conditions of T_c = +150°C and I_c > I_{c1} will latch in a thyristor mode of operation. When device latches, it must be commutated with minimum energy to prevent damage.

APT90GF100JN

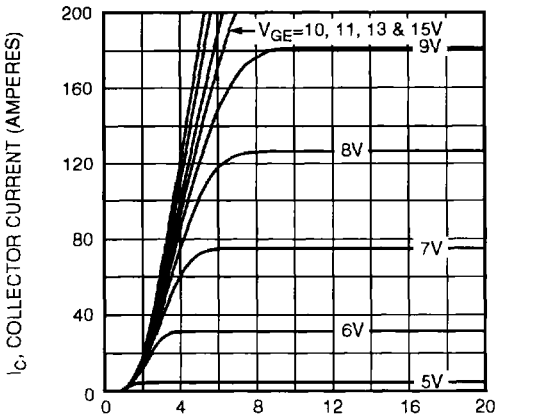


Figure 1, Typical Output Characteristics (T_J = 25°C)

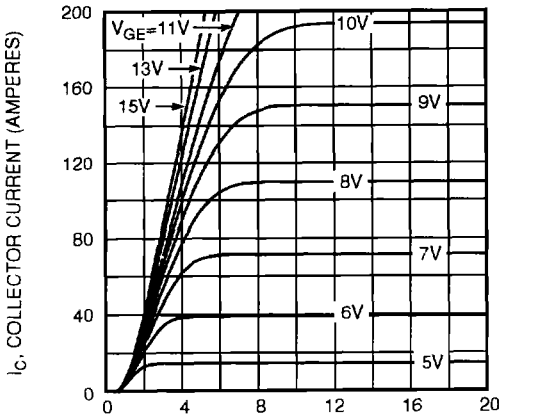


Figure 2, Typical Output Characteristics (T_J = 150°C)

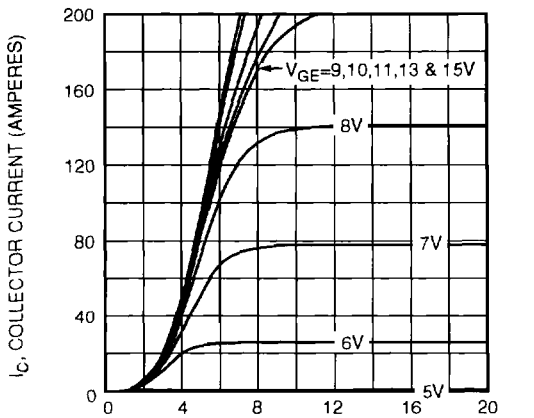


Figure 3, Typical Output Characteristics (T_J = -55°C)

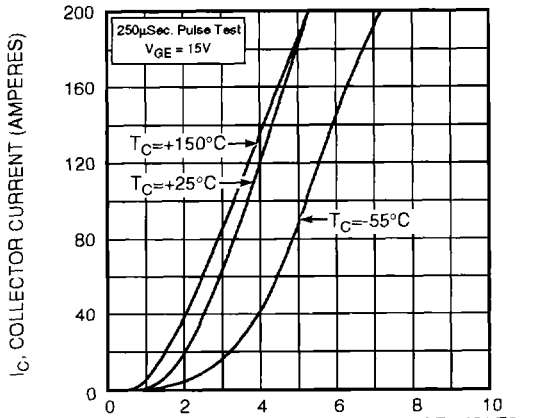


Figure 4, Typical Output Characteristics @ V_{GE} = 15V

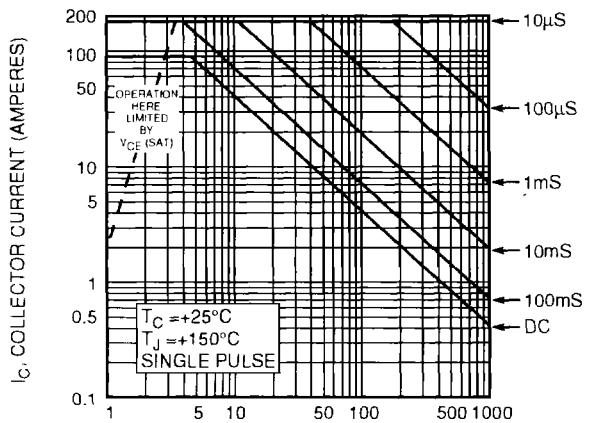


Figure 5, Maximum Forward Bias Safe Operating Area

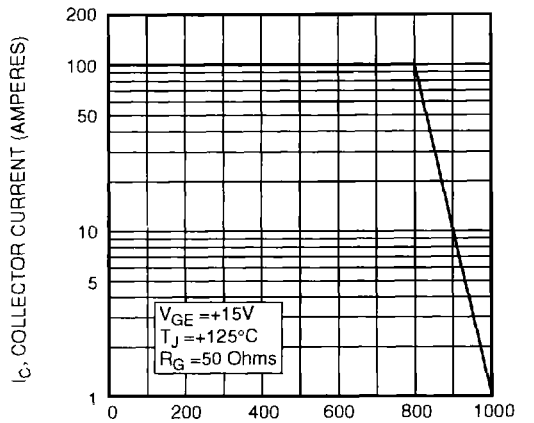


Figure 6, Maximum Reverse Bias Safe Operating Area

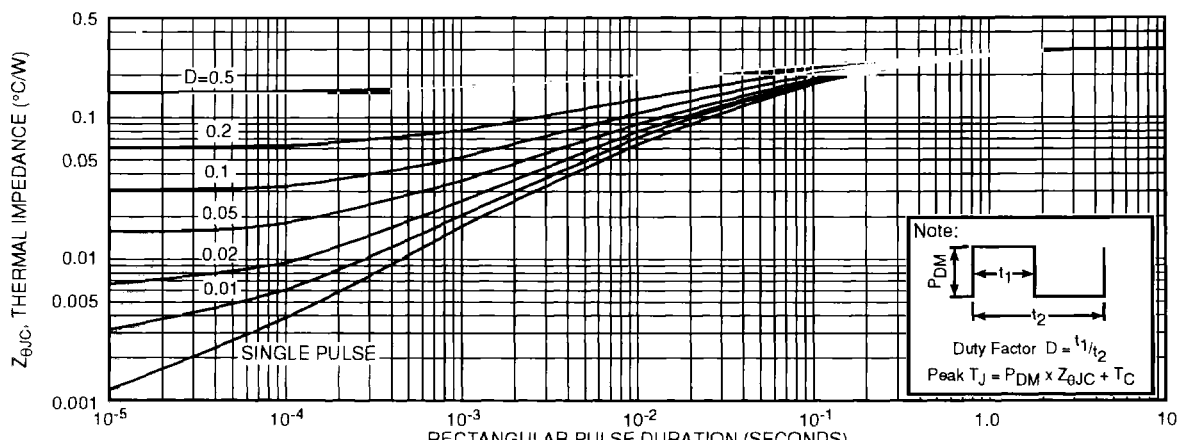


Figure 7, Maximum Effective Transient Thermal Impedance, Junction-To-Case vs Pulse Duration

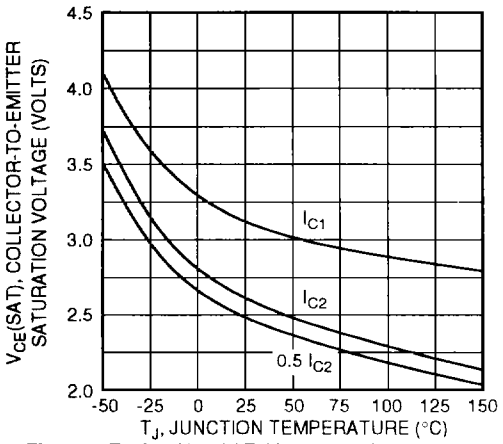


Figure 8, Typical V_{CE}(SAT) Voltage vs Junction Temperature

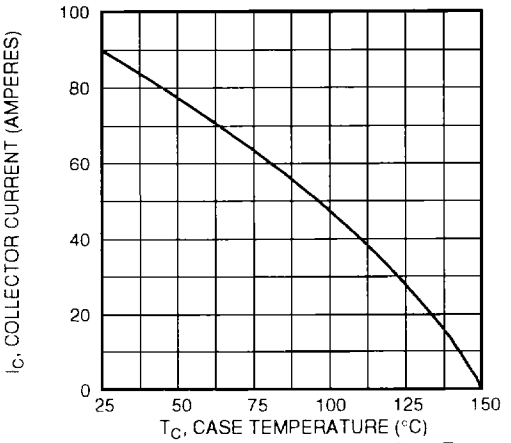


Figure 9, Maximum Collector Current vs Case Temperature

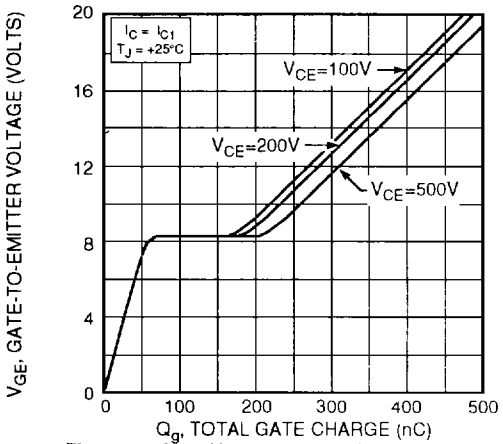


Figure 10, Gate Charges vs Gate-To-Emitter Voltage

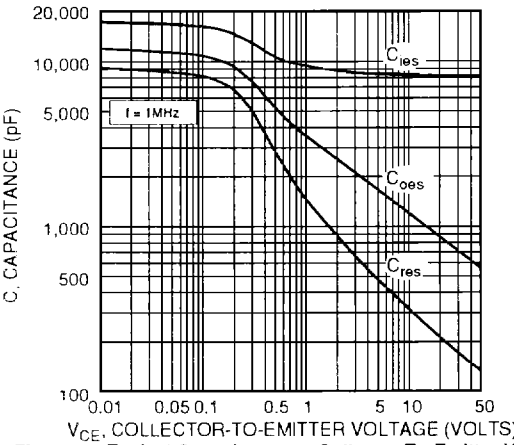


Figure 11, Typical Capacitance vs Collector-To-Emitter Voltage

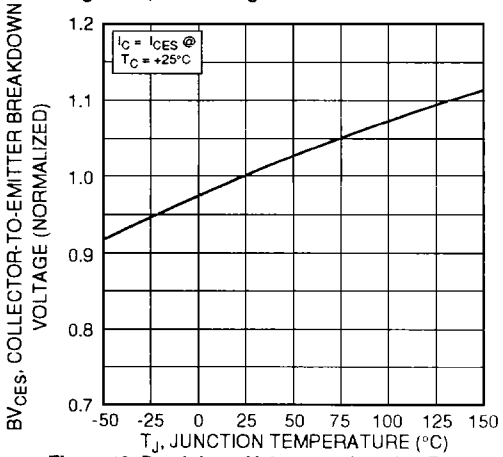


Figure 12, Breakdown Voltage vs Junction Temperature

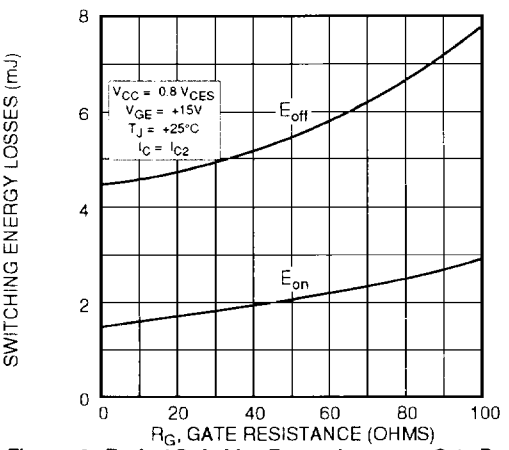


Figure 13, Typical Switching Energy Losses vs Gate Resistance

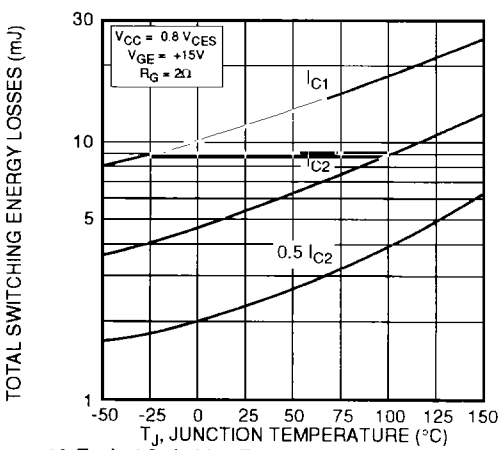


Figure 14, Typical Switching Energy Losses vs. Junction Temperature

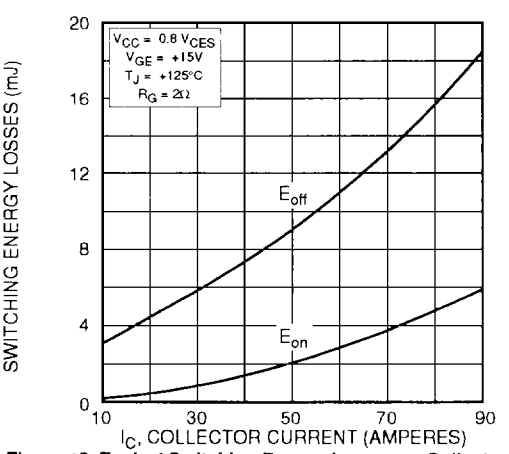


Figure 15, Typical Switching Energy Losses vs Collector Current

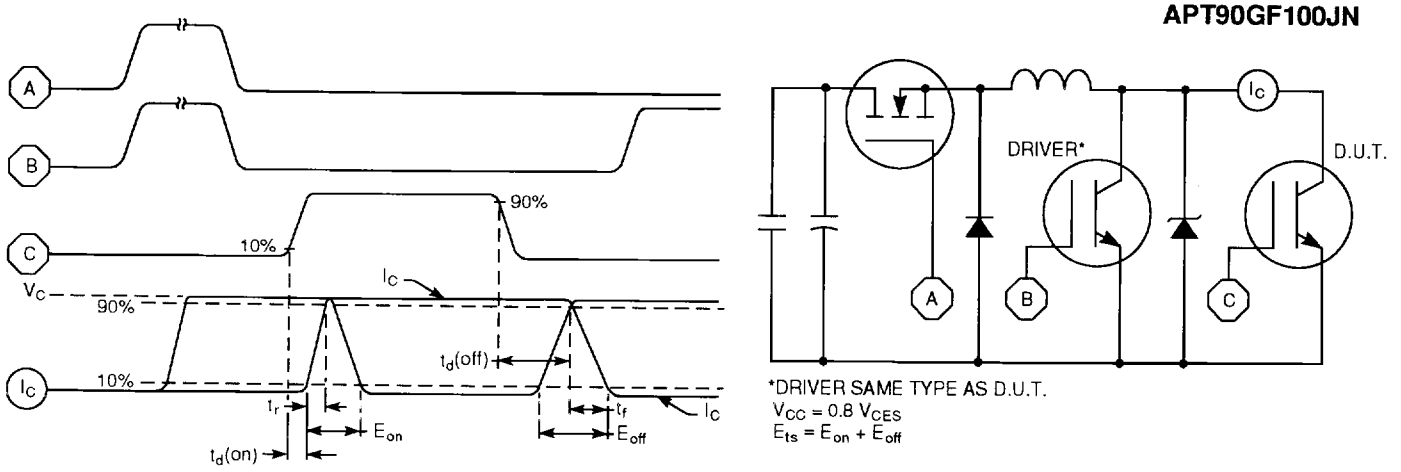


Figure 16, Switching Loss Test Circuit and Waveforms

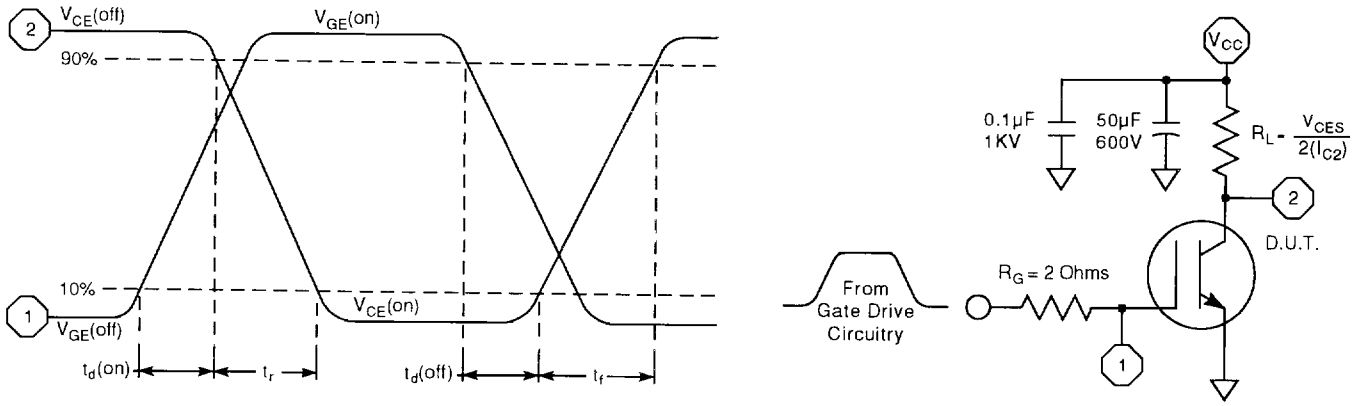
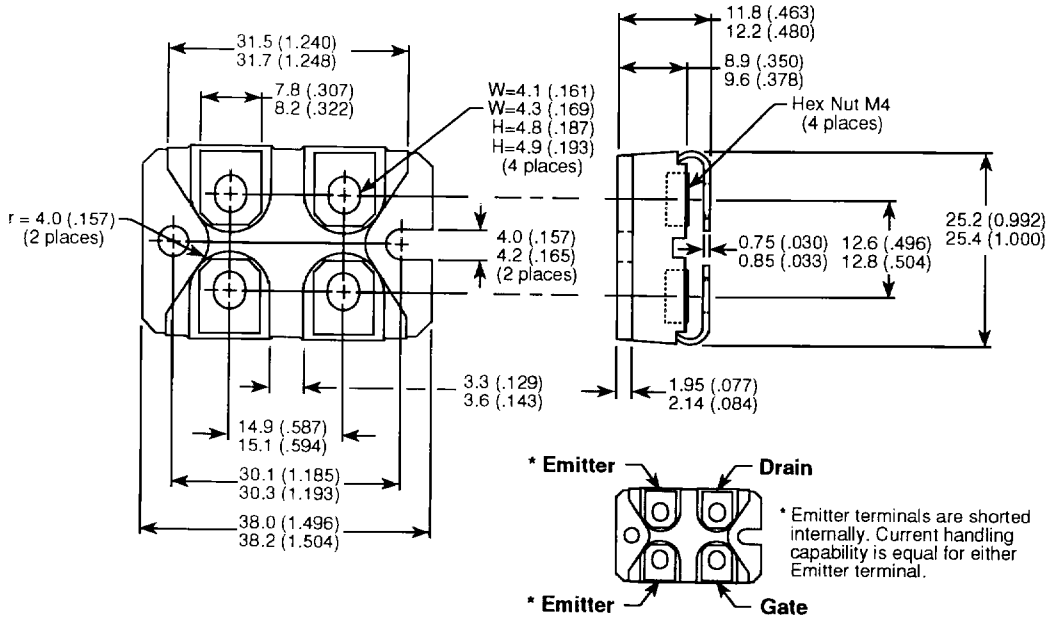


Figure 17, Resistive Switching Time Test Circuit and Waveforms

SOT-227 (ISOTOP®) Package Outline



Dimensions in Millimeters and (Inches)

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